

Amendment to the Claims

1-36. (Cancelled)

37. (New) A method for monitoring a high-resistivity reservoir rock formation

at least one less resistive formation, wherein said method comprises:

transmitting an electromagnetic signal (S) propagating from near a sea-floor by means of an electromagnetic transmitter powered by a voltage or current signal generator;

said electromagnetic transmitter comprises two electrodes of which one is connected to an upper end of an electrically conductive string in a well, said upper end being arranged near said seafloor;

said electromagnetic signal (S) propagating from said sea-floor to said high resistive formation as a guided-wave electromagnetic signal (S1) along said conductive string, and further propagating as a guided-wave electromagnetic signal (S2) inside said high-resistivity formation;

said electromagnetic signal (S2) giving rise to an upward refracting electromagnetic signal (R3) in said less resistive formation, said electromagnetic signal (R3) rising from an interface between said high-resistivity formation and said lower-resistivity formation, and giving rise to a steeply rising refraction wave front (F3); and

detecting said refracted electromagnetic wave front (F3) comprising refracted electromagnetic signals (R3), along an array of sensor antennas located along said sea-floor, said array of sensor antennas having a direction away from said transmitter.

38. (New) A method according to claim 37, wherein a first of said electrodes is connected to said upper end of said electrically conductive string for integrating part of said conducting string in a signal path for transmitting said electromagnetic signal (S), and a second of said electrodes is grounded, said first and second electrodes being supplied with electrical energy from said voltage signal generator.

39. (New) A method according to claim 37, wherein said electrically conductive string is a borehole casing that is cemented to a borehole wall by cement having a resistivity that is higher than the resistivity of said at least one low-resistivity formation, said cement providing improved waveguide properties for said electrically conductive string through said at least one low-resistivity formation for propagating said electromagnetic signals along said electrically conductive string.

40. (New) A method according to claim 37, further comprising detecting apparent horizontal speeds of said detected refracted electromagnetic wave front (F3) along the seafloor as registered along different areas (A1, A2) along said array of sensor antennas in order to distinguish a first horizontally extending area showing higher apparent horizontal speeds indicating a presence of oil-wet or oil-saturated rocks of said high-resistivity reservoir rock formation, from a second horizontal area (A2) of lower apparent horizontal speeds indicating a presence of water-wet or water-saturated rocks having lower resistivity in the same geological formation.

41. (New) A method according to claim 40, wherein said apparent horizontal speed of said received refracted signal wave front (F3) is calculated on the basis of phase angle differences between the signal received at said array of sensor antennas which have different offsets along the seafloor.

42. (New) A method according to claim 37, wherein said method comprises detecting amplitudes of said detected refracted electromagnetic wave front (F3) along the seafloor as registered in different horizontal areas (A1, A2) along said array of sensor antennas along the seafloor in order to distinguish a first horizontal area (A1) having relatively higher amplitudes indicating relatively higher resistivity due to oil-wet or oil-saturated rocks of said high-resistivity reservoir rock formation, from a horizontally extending area (A2) of relatively lower amplitudes indicating relatively lower resistivity due to water-wet or water saturated rocks in the same geological formation.

43. (New) A method for monitoring a high-resistivity reservoir rock formation located below at least one lower-resistive formation, said method comprising:

transmitting an electromagnetic signal (S) propagating from near a sea-floor by means of an electromagnetic transmitter powered by a voltage or current signal generator, wherein said electromagnetic transmitter comprises an antenna transmitting

said electromagnetic signal (S) to an upper end of an electrically conductive string, said upper end of said electrically conductive string being arranged near said seafloor,

said electromagnetic signal (S) propagating from said sea-floor to said high-resistivity reservoir rock formation as a guided-wave electromagnetic signal (S1) along said conductive string, and further propagating as a guided-wave electromagnetic signal (S2) inside said high-resistivity reservoir rock formation,

said electromagnetic signal (S2) giving rise to an upward refracting electromagnetic signal (R3) in said at least one lower-resistive formation, said electromagnetic signal (R3) rising from an interface between said high-resistivity reservoir rock formation and said at least one lower-resistive formation, and giving rise to a steeply rising refraction wave front (F3); and

detecting said refracted electromagnetic wave front (F3) comprising refracted electromagnetic signals (R3) along an array of sensor antennas located along said sea-floor, said array having a direction away from said electromagnetic transmitter.

44. (New) A method according to claim 43, wherein said electrically conductive string comprises a steel casing or a liner.

45. (New) A method according to claim 43, wherein a lower end of said electrically conductive string penetrates at least an upper interface between said high-resistivity reservoir rock formation and said at least one lower-resistive formation.

46. (New) A method according to claim 43, wherein said antenna transmits said electromagnetic signal (S) to said upper end of said electrically conductive string, and said antenna is a toroidal antenna receiving electrical energy from said voltage signal generator.

47. (New) A method according to claim 43, wherein a lower end of said electrically conductive string resides at a depth intermediate between said seafloor and said high-resistivity reservoir rock formation, and does not penetrate an upper interface between said high-resistivity reservoir rock formation and said at least one lower-resistive formation.

48. (New) A method according to claim 47, wherein said toroidal antenna is arranged so as to substantially envelope said upper end of said electrically conductive string.

49. (New) A method according to claim 47, wherein said toroidal antenna is provided with a ring core having high permeability.

50. (New) A method according to claim 47, wherein said electromagnetic signal (S) has a frequency in a range of 0.1 Hz and 1000 Hz.

51. (New) A method according to claim 47, wherein the power supplied by said generator is in a range of 10 W and 10 kW.

52. (New) A method for monitoring a subterranean petroleum bearing formation having higher relative resistivity and being buried under other rock formations having lower relative resistivity, using polarized electromagnetic waves, said method comprising:

arranging a transmitter antenna comprising a pair of electrodes arranged in a borehole crossing said petroleum bearing formation, wherein said electrodes are arranged above and below said petroleum bearing formation, respectively;

arranging one or more receiver antennas along a seafloor above said rock formations, said antennas being provided to receive the polarized electromagnetic waves;

emitting vertically polarized waves from said transmitter antenna into said petroleum bearing formation; and

receiving refracted electromagnetic waves by means of said receiving antennas arranged along the seafloor above said petroleum bearing formation; and

analyzing geometric properties of said petroleum bearing formation.

53. (New) A method according to claim 52, wherein said vertically polarized waves have a frequency in a range of 0.1 Hz and 1000 Hz.